

USDA – North Carolina Cooperative Rabies Management Program

2007 One Medicine Conference



Carl Williams

NC Division of Public Health

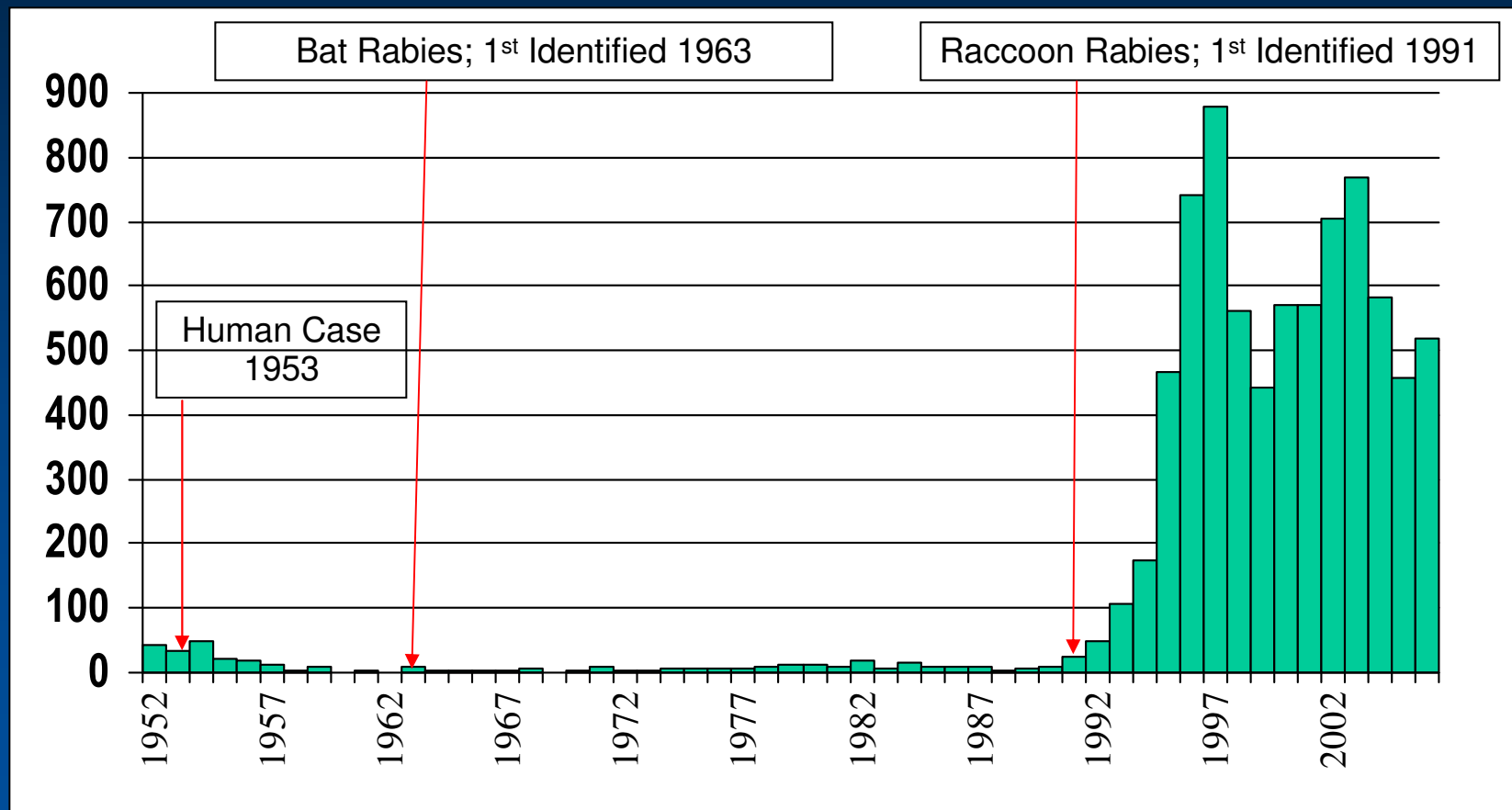


Rabies has the highest case fatality rate of any known infectious disease and is virtually 100% fatal following the onset of clinical symptoms.

The only way to prevent clinical rabies after exposure is by vaccination.

Confirmed Rabid Animals, 1952-2006, NC

n = 8013

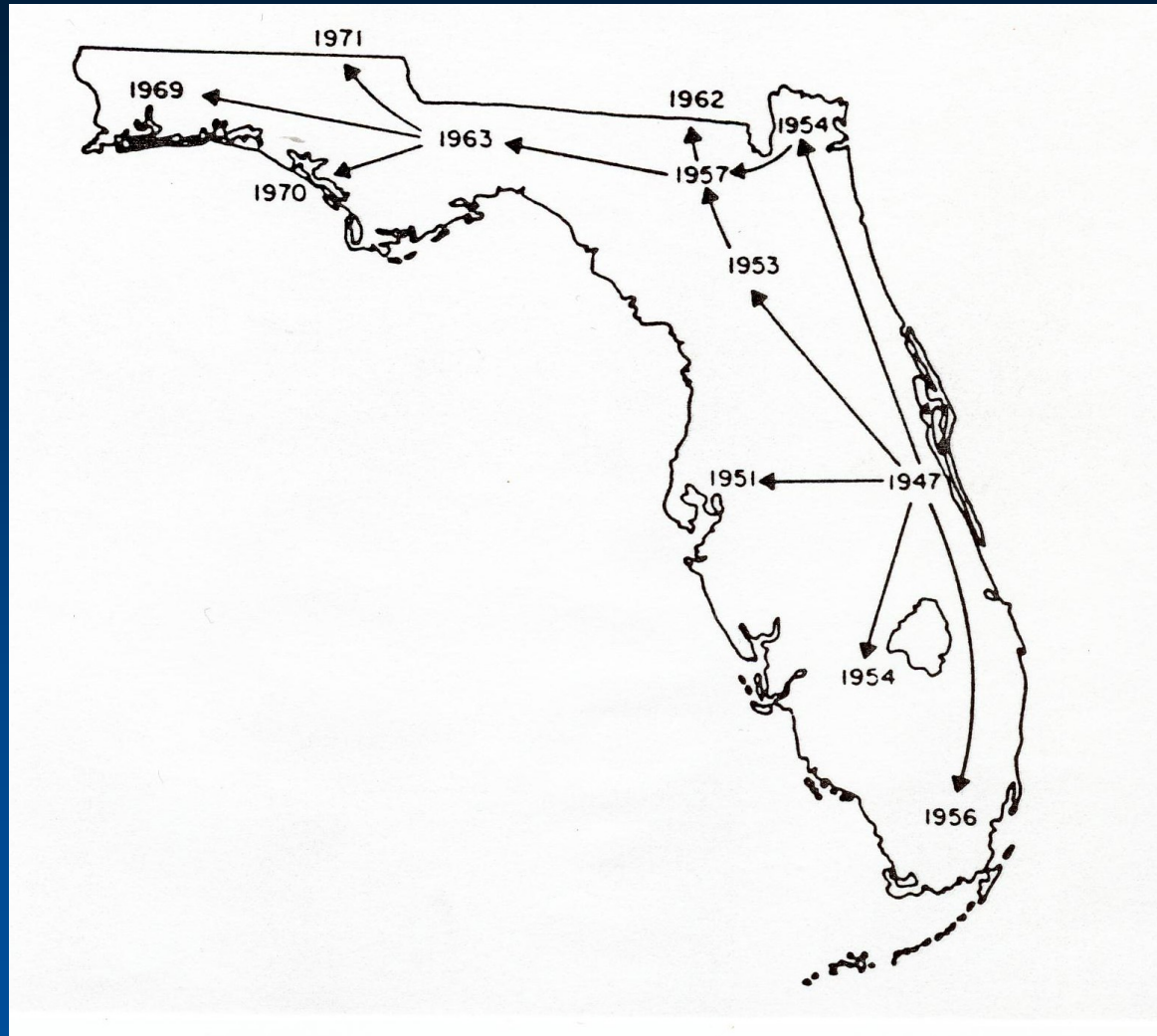


North Carolina Public Health

Rabies Prevention and Control

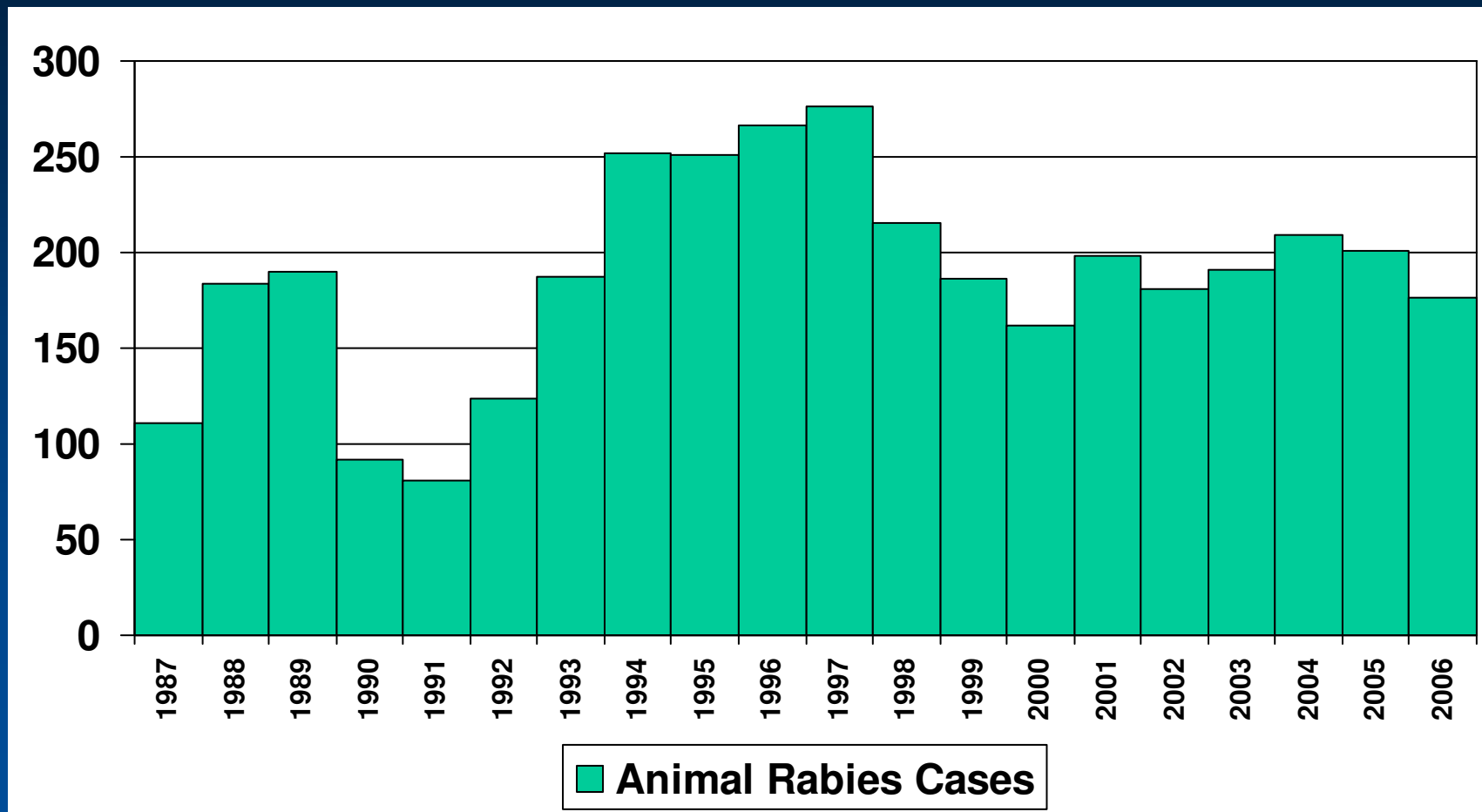
- Human rabies prevention through
 - Rabies exposure risk assessment
 - Targeted treatment using vaccine and HRIG
 - Pre exposure prophylaxis where appropriate
 - Access to vaccine through Indigent Program
- Mandatory dog and cat vaccination
- Rabies surveillance, all species
- Cooperative rabies suppression programs
- Education

Progression of Raccoon Rabies in FL



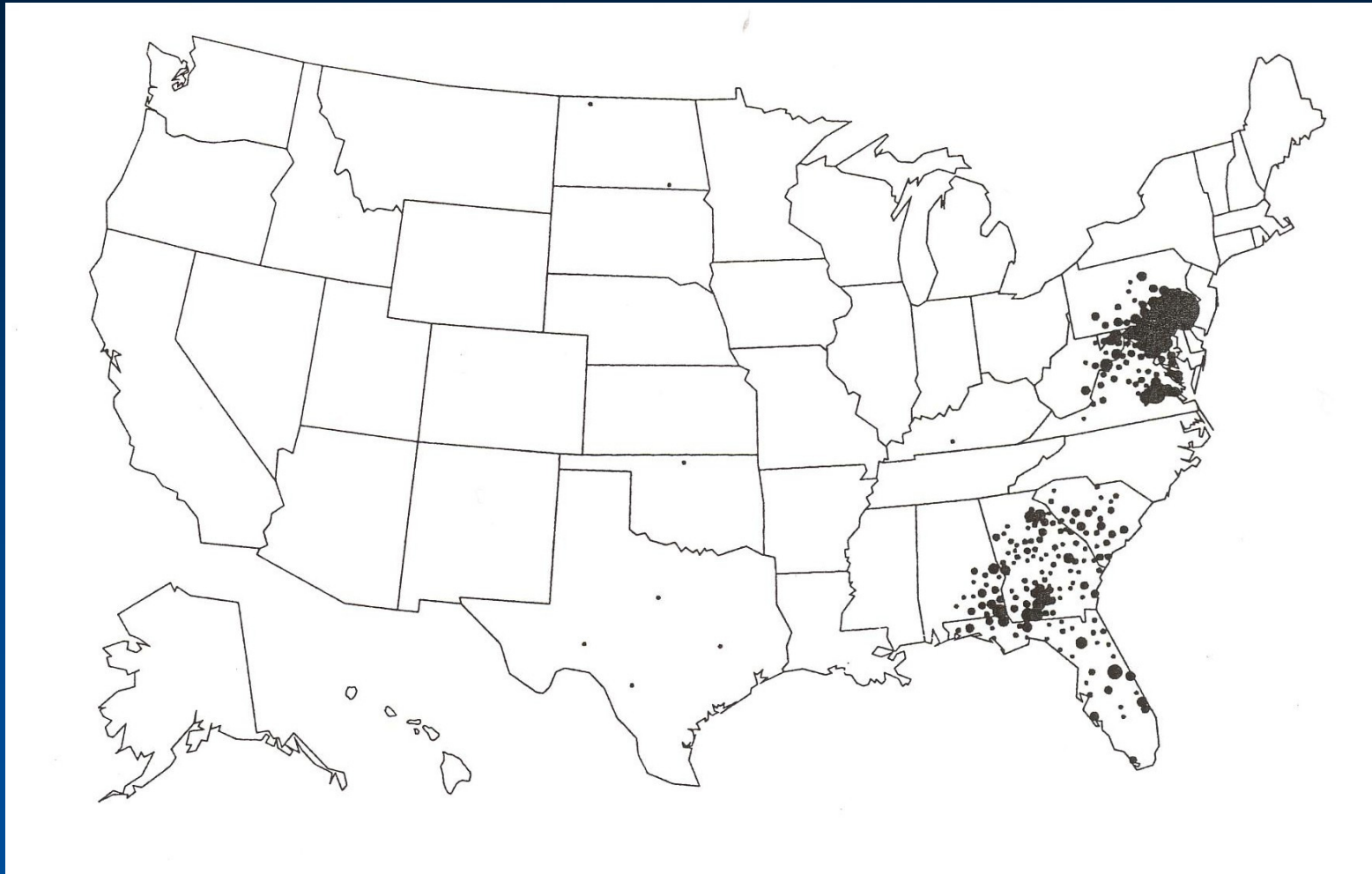
Raccoon Rabies. In: The Natural History of Rabies. 2nd ed.
CRC Press; 1991; 329

Florida Animal Rabies Cases, 1987-2006, n=3733



Source: Florida Division of Environmental Health

Raccoon Rabies Distribution, US, 1988



Raccoon Rabies. In: The Natural History of Rabies. 2nd ed.
CRC Press; 1991; 327

Cases by County

Number

0

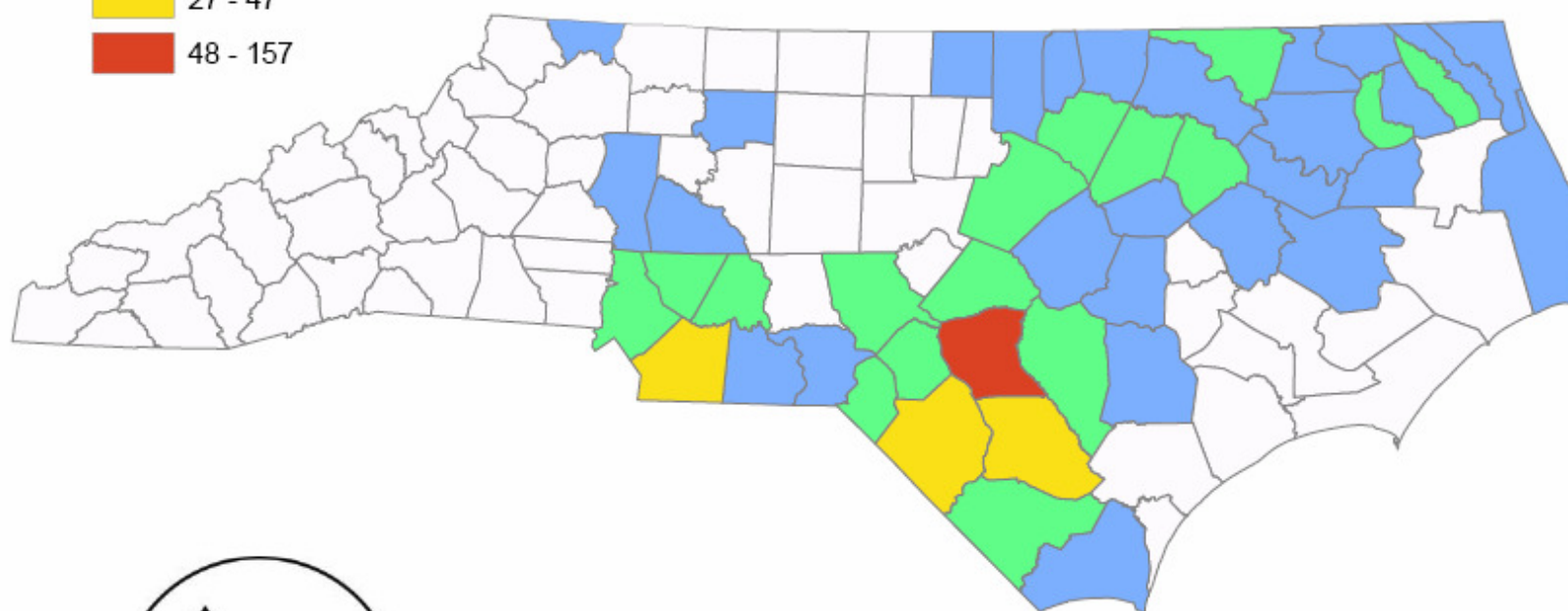
1 - 9

10 - 26

27 - 47

48 - 157

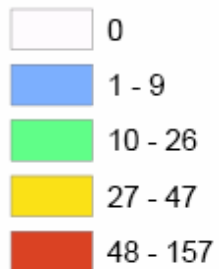
Rabies Cases, Common Raccoon North Carolina, 1991 - 1995 n = 619



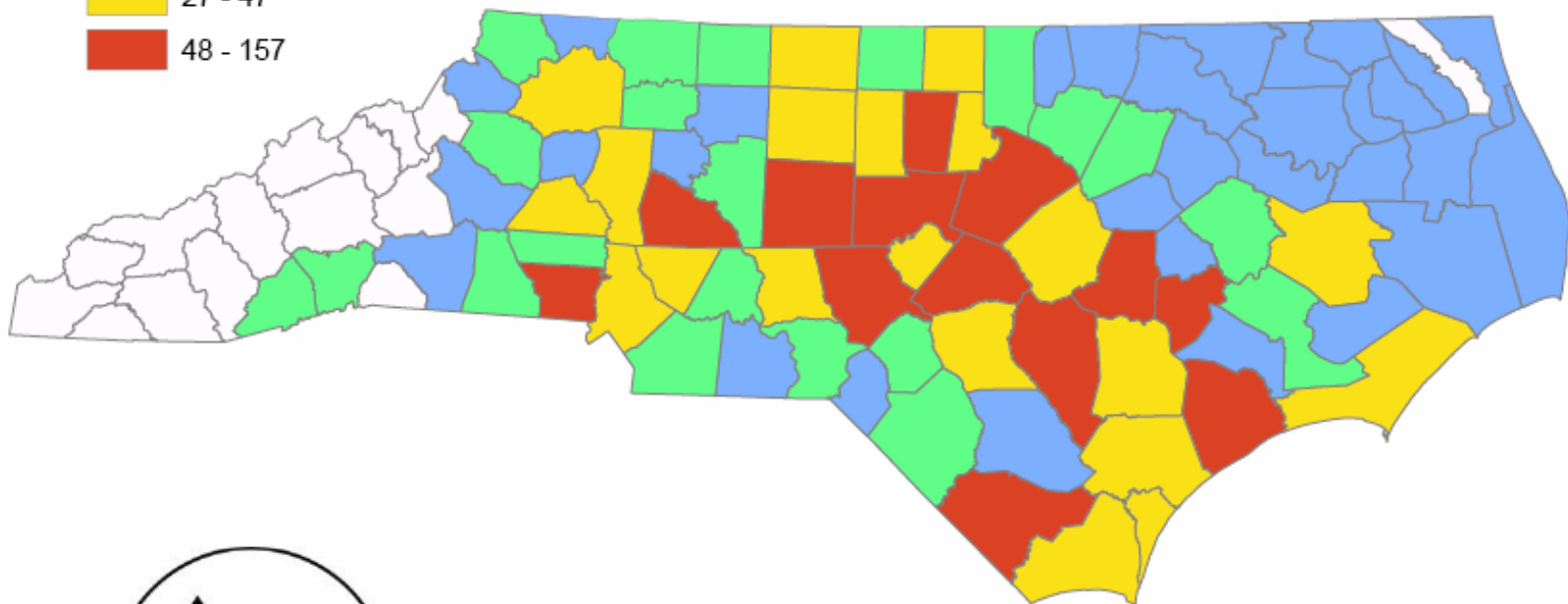
Data Source: NC State Laboratory of Public Health

Cases by County

Number



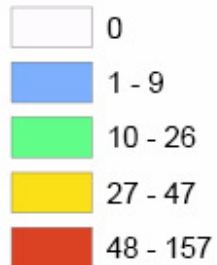
Rabies Cases, Common Raccoon North Carolina, 1996 - 2000 n = 2336



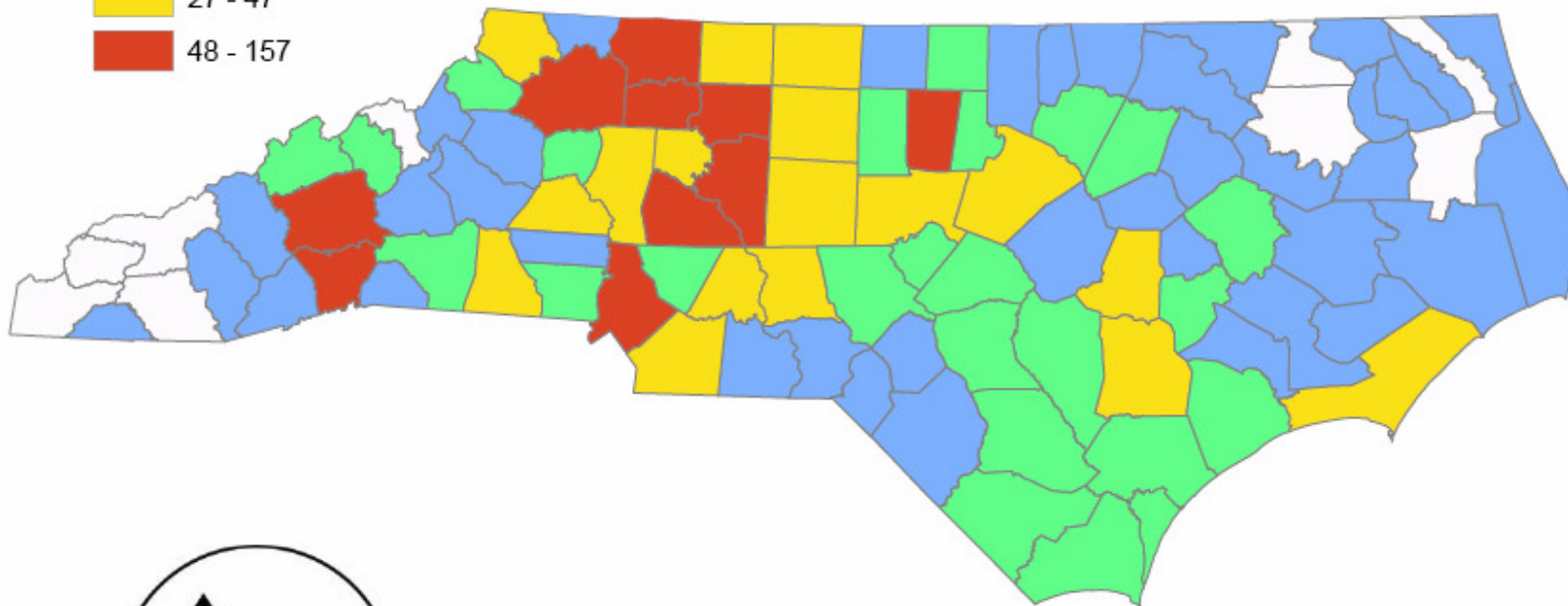
Data Source: NC State Laboratory of Public Health

Cases by County

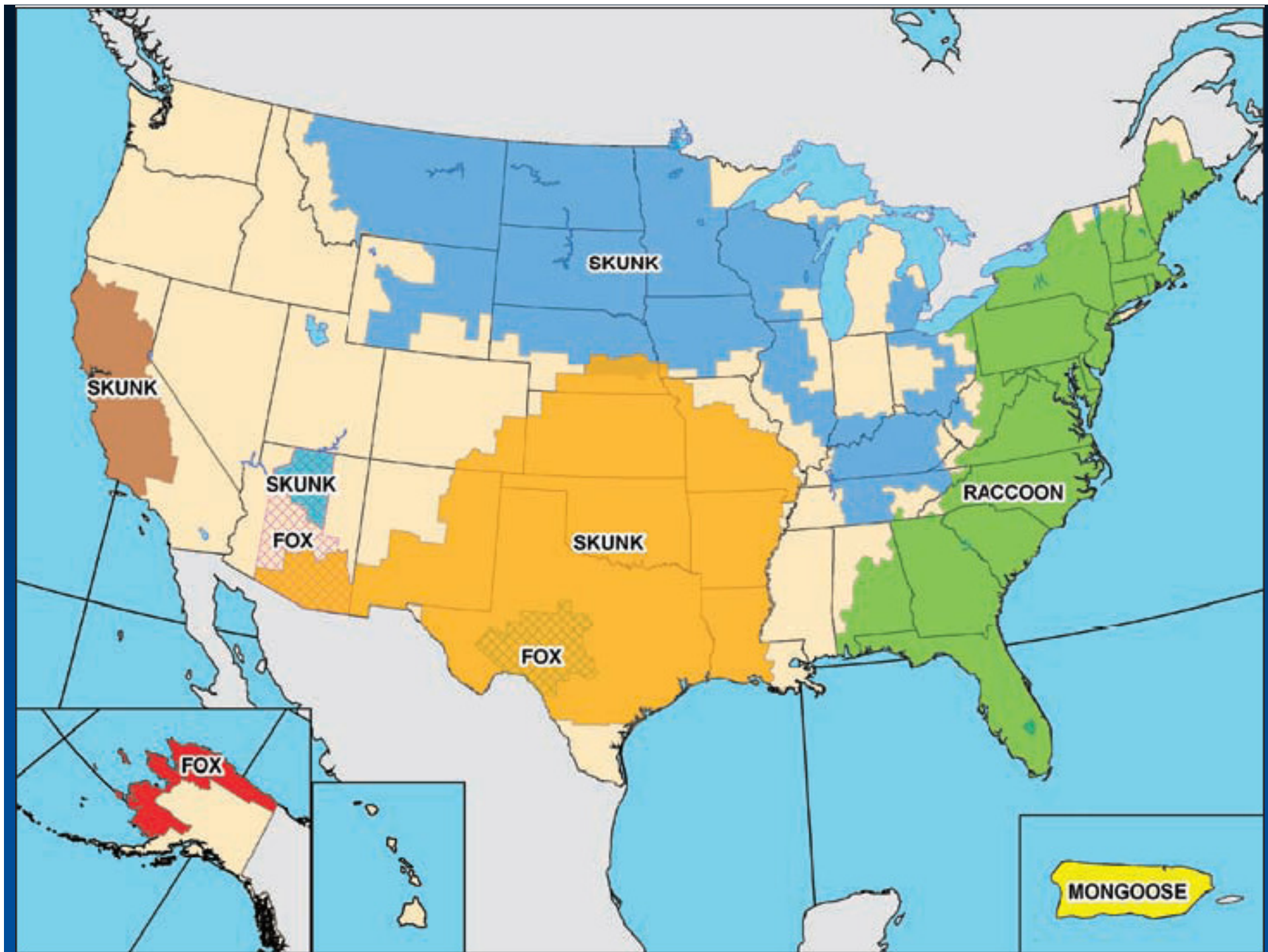
Number



Rabies Cases, Common Raccoon North Carolina, 2001 - 2005 n = 1973

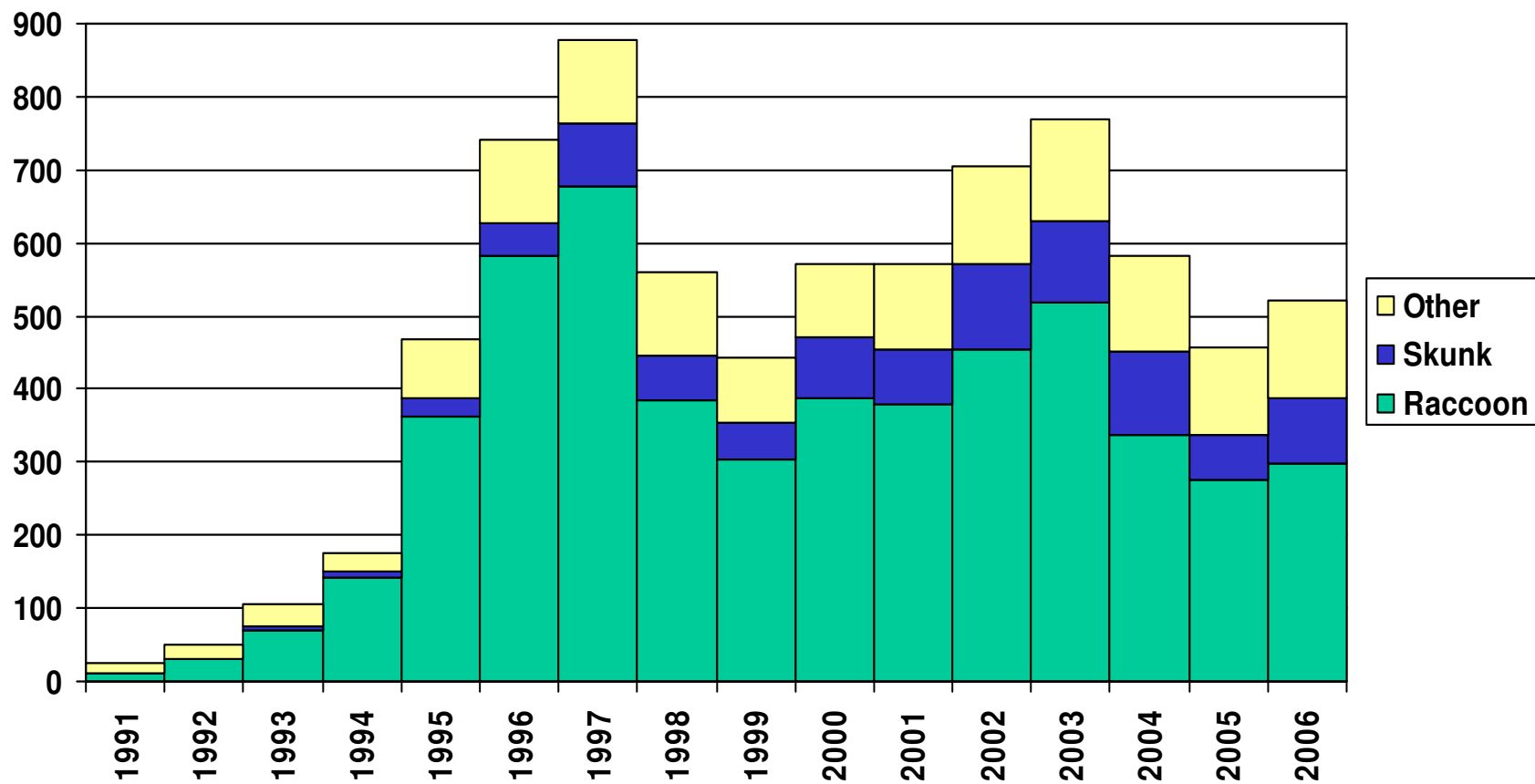


Data Source: NC State Laboratory of Public Health



Confirmed Rabid Animals, 1991-2006, NC

n = 7621



The Real Problem with Raccoon Rabies

- Very efficient transmission among the reservoir species
 - Large numbers of rabid animals
- Associated public health cost





“We live in a sea of rabies”

Dr. Rupprecht, Chief of
CDC rabies lab, at 2007
WRD symposium

Two States - Animal Rabies Cases

One With, One Without, Raccoon Rabies

	2001	2002	2003	2004	2005	2006
	571	706	769	582	458	521
	20	16	14	10	28	22

NC: 8,856,505 people

53,865 mi²

WI: 5,556,506 people

65,498 mi²

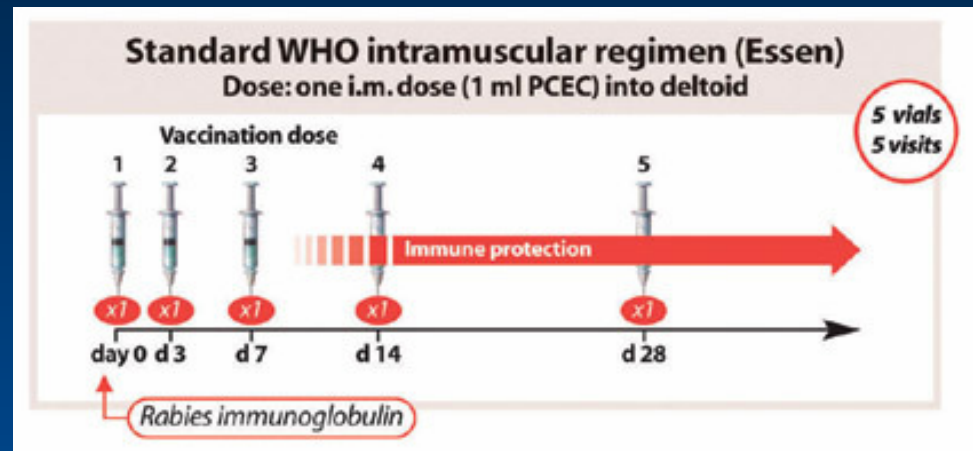
Public Health Cost of Raccoon Rabies

- Rabies post exposure prophylaxis is expensive
 - \$1,000.00 - \$4,500.00 per patient
- New Jersey PEP costs...
 - Before raccoon rabies: \$1,100 per 100,000
 - After raccoon rabies: \$74,734 per 100,000

Uhaa, et. al. Benefits and costs of using an orally absorbed vaccine to control rabies in raccoons. JAVMA. 1992, 201. 1873-82

Public Health Cost of Raccoon Rabies

- Massachusetts PEP administration...
 - Before raccoon rabies: 1.7 per 100,000
 - After raccoon rabies: 45 per 100,000



Kreindel, et. al. The cost of rabies post exposure prophylaxis: one state's experience. Public Health Reports. 1998, 113. 247-251

Dogs and Cats

- It is estimated that each year in the US
 - Millions of dog and cat bites occur
 - Resulting in ~ 300,000 ED visits
- In the state of Victoria, Australia, 1998-2004
 - 12,982 bites occurred
 - 79.6% due to dogs
 - 8.7% due to humans!!
 - 7.2% due to cats

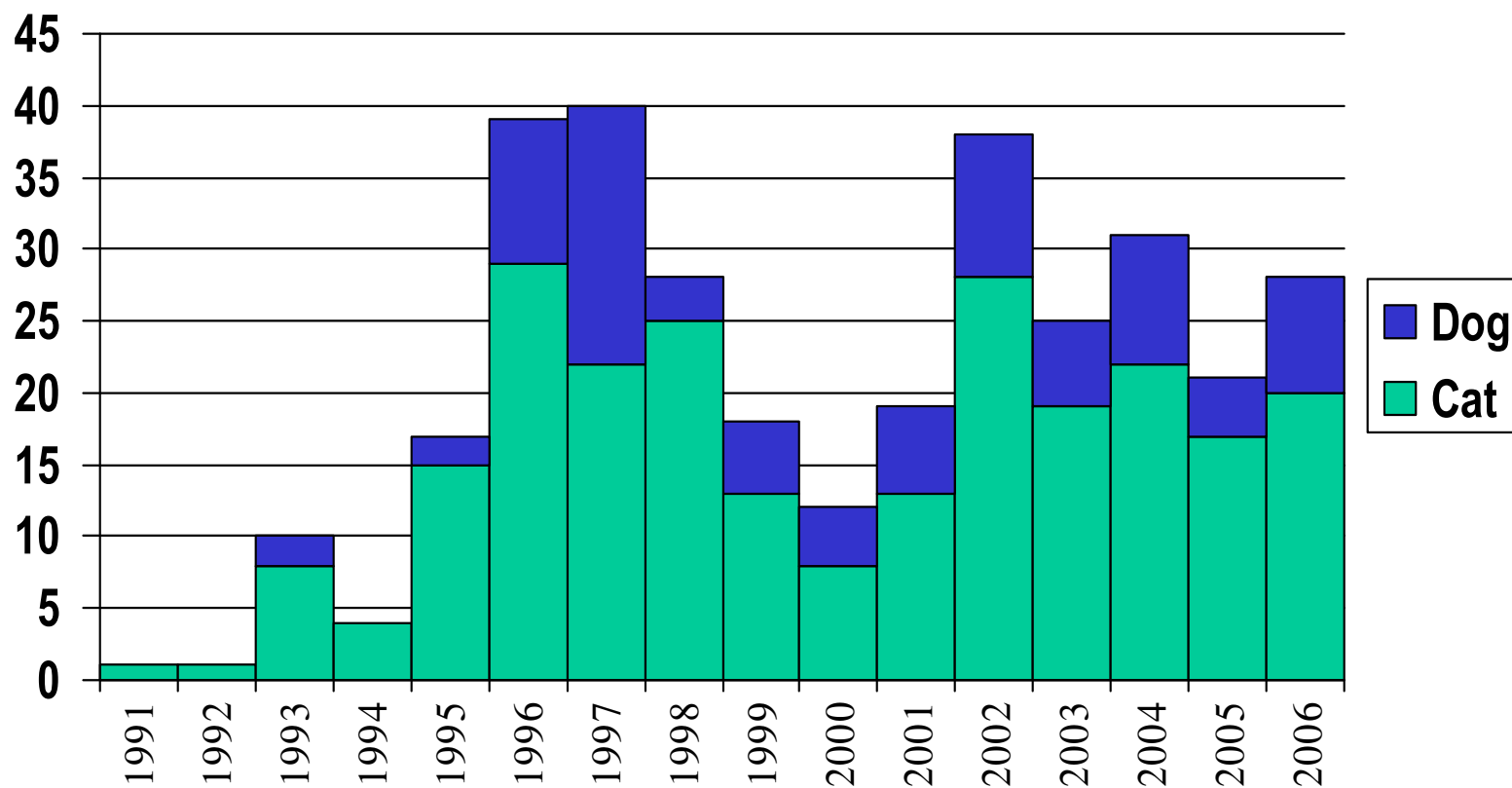


D  n't Wait, Vaccinate!

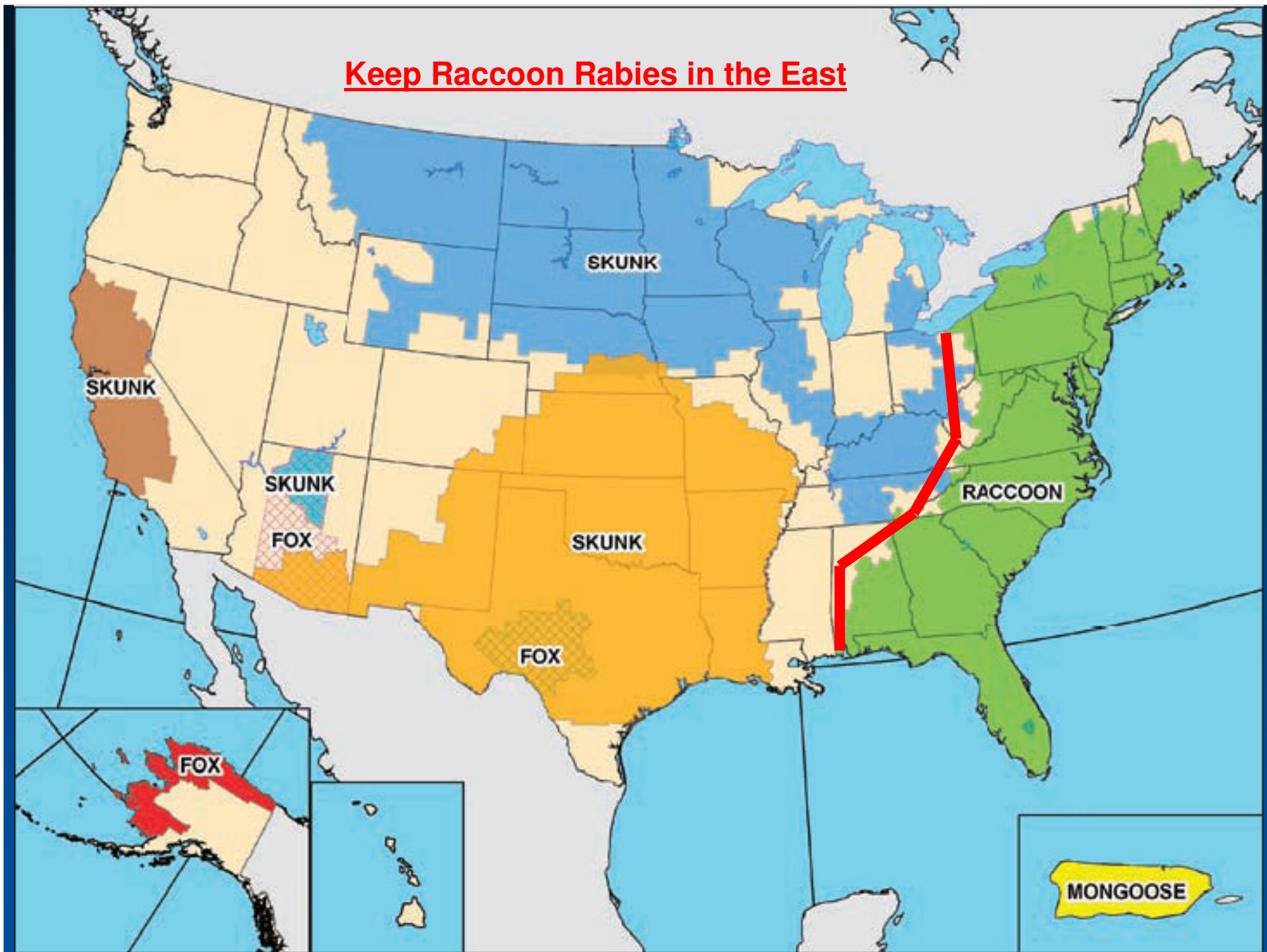
Mac Bean, et. al. Animal and human bite injuries in victoria, 1998-2004. MJA. 2007, 186(1). 38-40.

Confirmed Rabid Dogs and Cats, NC

VACCINATE YOUR PETS, RABIES KILLS



Keep Raccoon Rabies in the East



ORV Development in the US

- Initial experimental programs
 - Parramore Island VA, 1990
 - Williamsport PA, 1991
 - Cape May NJ, 1992-1993
- Federal support for coordinated ORV in 1998 allowed for creation of cooperative programs in 15 states to halt western expansion of raccoon rabies

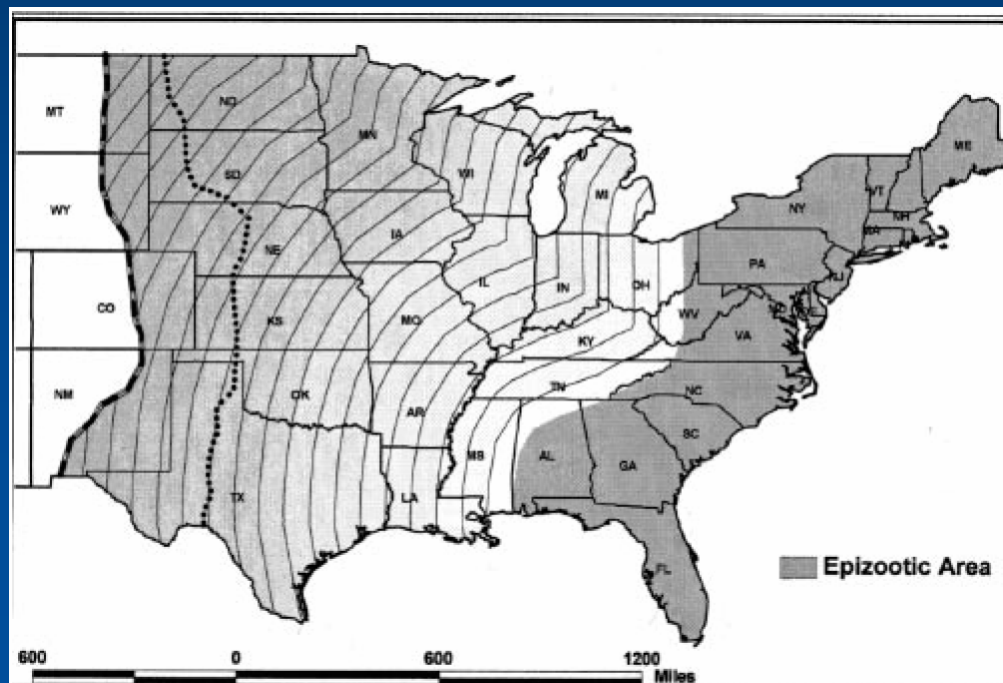
Economic Analysis of ORV to Control Raccoon Rabies

- Combining ORV with natural barriers may be economically feasible
- Over a 20 year horizon
 - Cost to establish and maintain a barrier
 - \$58 to \$148 Million
 - Net benefit of program implementation
 - \$48 to \$496 Million

Kemere, et. al. Economic Analysis of a Large Scale Oral Vaccination Program to Control Raccoon Rabies. USDA NWRC Symposia. 2000.

National ORV Program

- Vision
 - Eliminate rabies in terrestrial carnivores
- Immediate Goals
 - Prevent raccoon strain of rabies virus from moving into new, uninfected areas

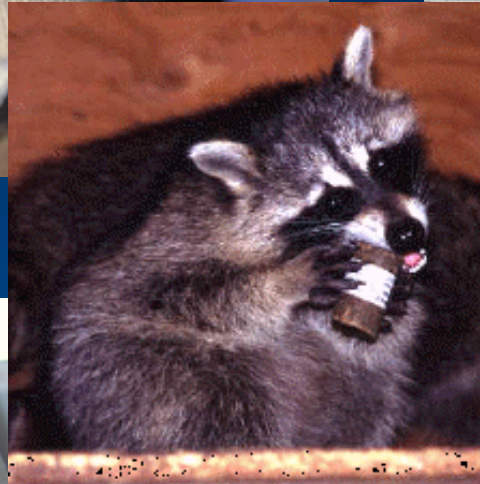


Why Bait North Carolina?

- Raccoons migrate along these rivers into TN, bringing rabies with them
- Rabies epizootic was breaching the Appalachian ridge

Keep Tennessee Raccoon Rabies Free



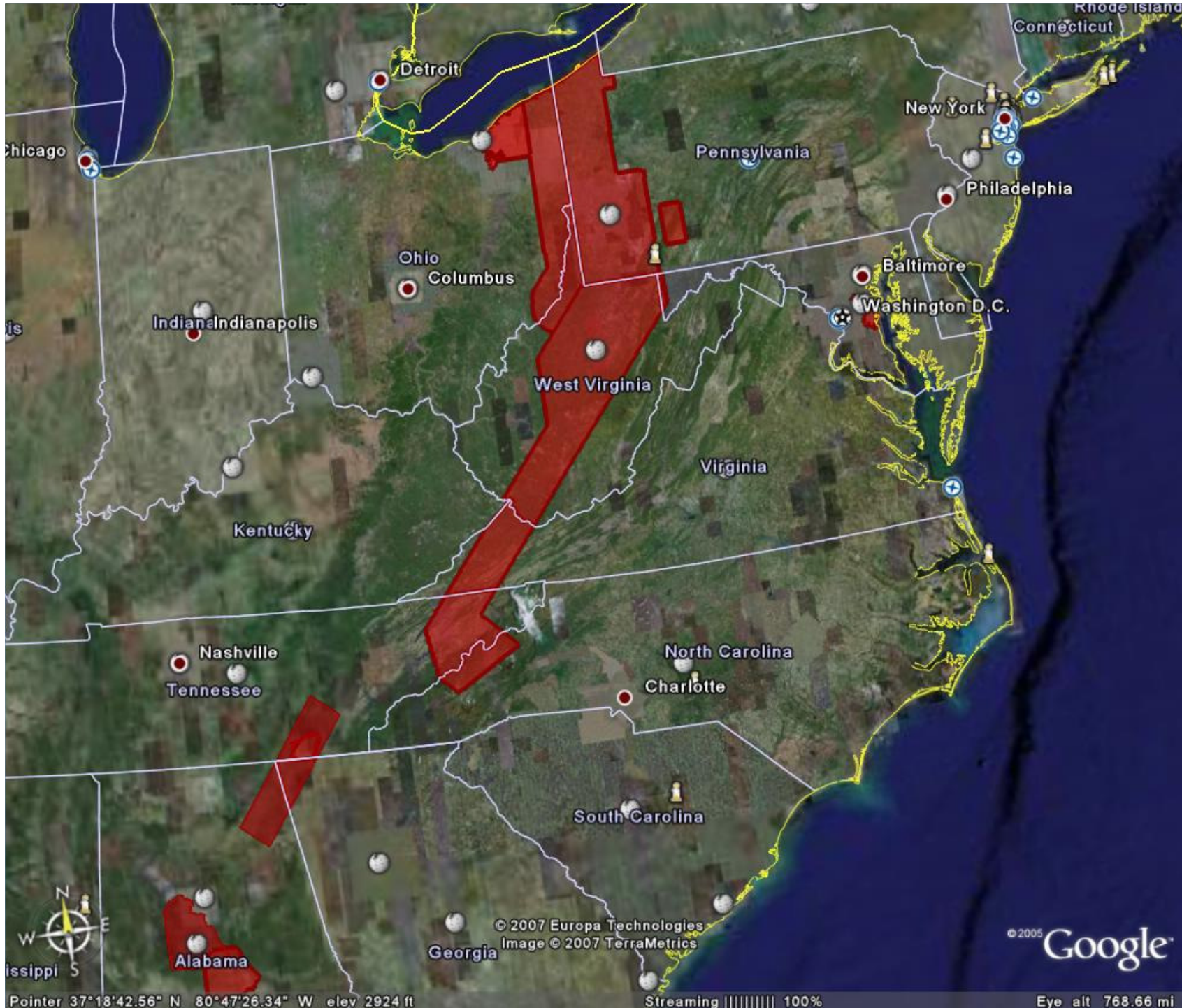


County ORV Distribution 2005

2475.1 km² = 55 baits/km²

County	Fixed-wing CS	Ground FMP	Total
Buncombe	5,634		5,634
Haywood	48,149		48,149
Madison	51,265	1,684	52,949
Mitchell	6,551	158	6,709
Yancey	22,099	317	22,416
Total	133,698	2,159	135,857

Cost of Baits ~ \$137,000



2005

Ride the Vomit Comet!

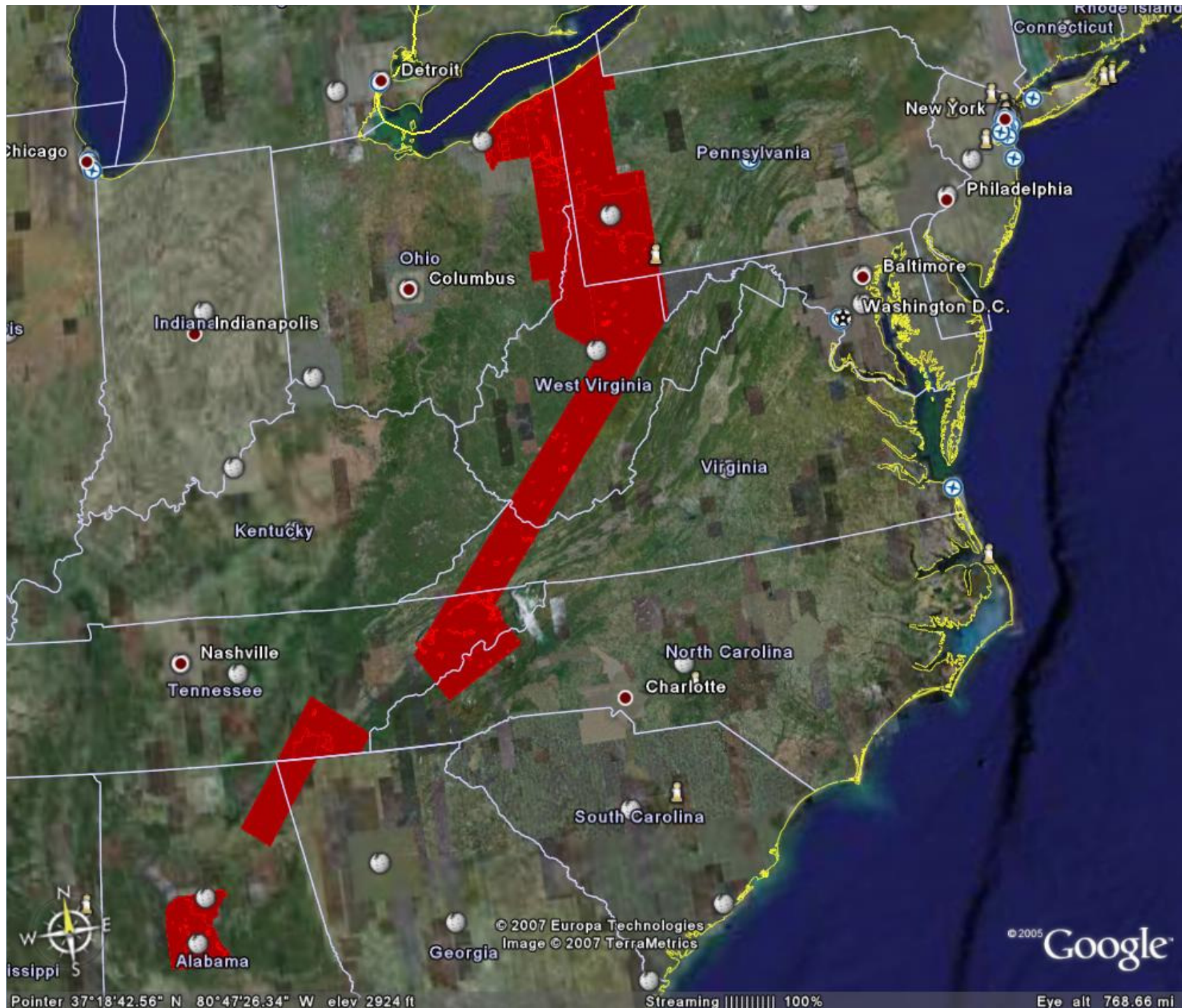


County ORV Distribution 2006

2888.5 km² = 64 baits/km²

County	Fixed-Wing CS	Ground FMP	Total
Buncombe	8,288		8,288
Haywood	47,053		47,053
Jackson	1,470		1,470
Madison	74,516	1,690	76,206
Mitchell	13,575	150	13,725
Swain	9,850		9,850
Yancey	28,020	320	28,340
Total	182,772	2,160	184,932

Cost of Baits ~ \$186,000

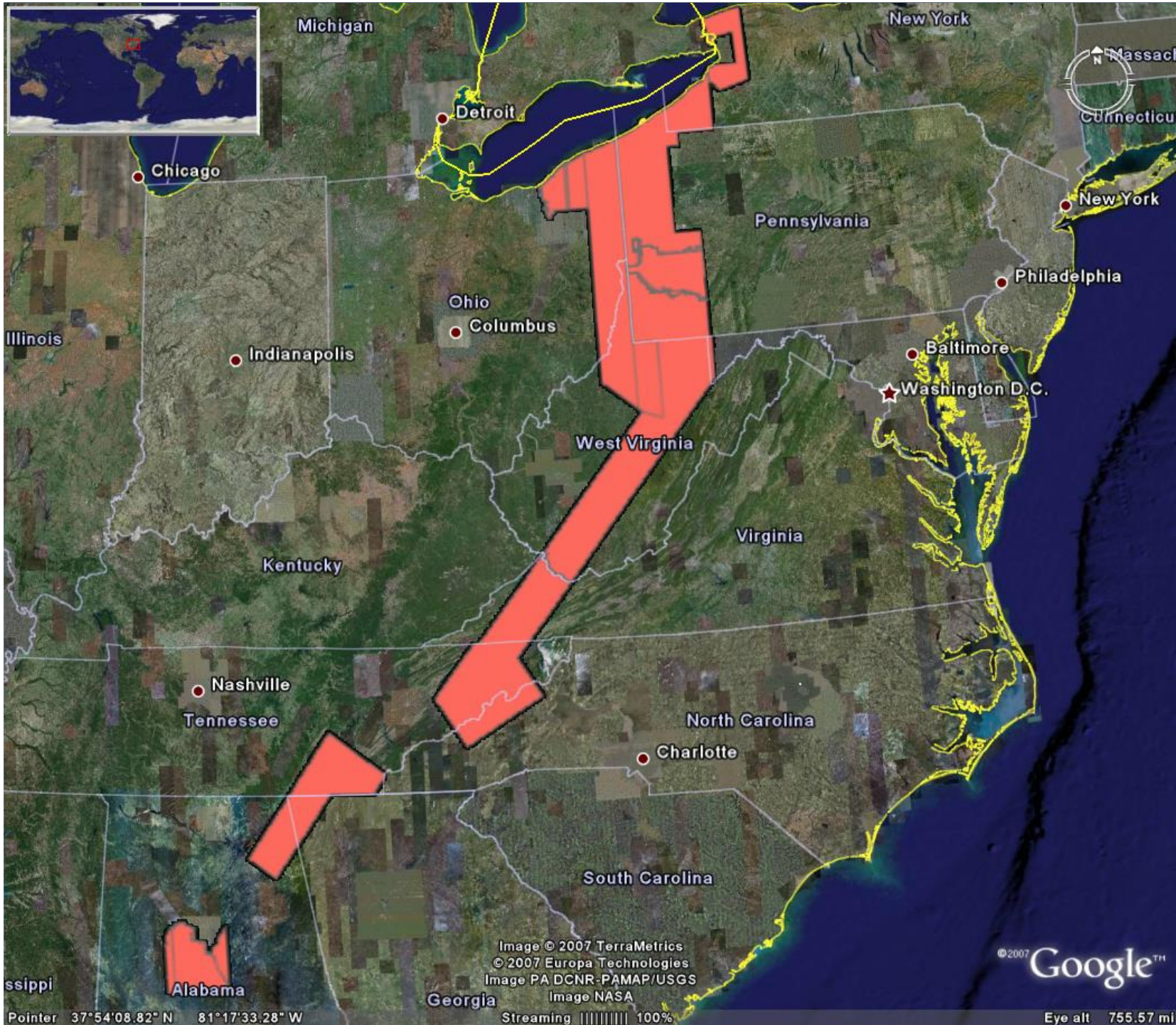


2006

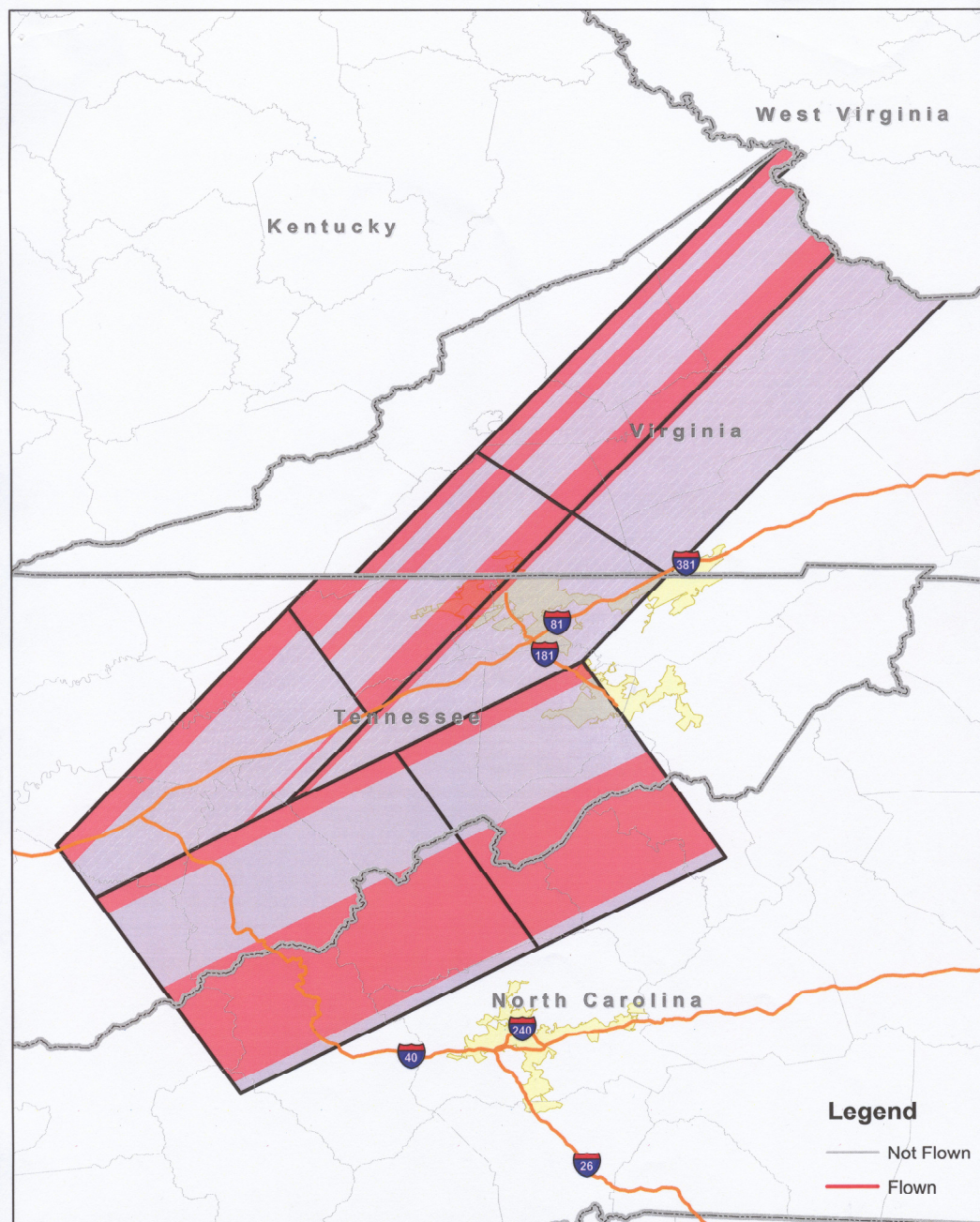
County ORV Distribution 2007

2868 km² = 64 baits/km²

County	Fixed-Wing CS	Ground FMP	Total
Buncombe	7,472		7,472
Haywood	44,931		44,931
Jackson	1,229		1,229
Madison	75,448	1,690	77,138
Mitchell	15,668	150	15,818
Swain	9,593		9,593
Yancey	27,528	320	27,848
Total	181,869	2,160	184,029

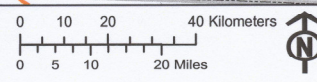


2007



USDA United States Department of Agriculture
Animal and Plant Health Inspection Service
Wildlife Services
National Rabies Management Program

**2007 Greeneville
ORV Project**



Interdisciplinary Requirements are Essential for Effective ORV

1. Baiting support: air and ground
2. Baiting strategies: GIS planning
3. Communication planning
4. Contingency Action Plan
5. Economic Analysis
6. NEPA Compliance
7. ORV Evaluation
8. Research Prioritization
9. Surveillance and Laboratory Support
10. Vaccine / Bait / Biomarker

Slate, et al. Status of oral rabies vaccination in wild carnivores in the US. Virus Research, 111 (2005) 68-76

Challenges to National ORV Program

Need additional oral rabies vaccines

- Raboral V-RG not immunogenic in skunks
- Raboral V-RG is a vaccinia virus vector for the rabies glycoprotein and has the potential to cause human illness
 - In reality only one human vaccinia virus infection associated with Raboral V-RG has been recorded

Rupprecht CE, Blass L, Orciari LA, et al. Human infection due to recombinant vaccinia-rabies glycoprotein virus. N Engl J Med. 2001; 345:582-6.

Challenges to National ORV Program

Strategy considerations for targeting terrestrial carnivores

- High population densities of raccoons and other reservoir species presents challenges to achieving rabies management goals
- ORV alone may be insufficient
 - Contraception
 - Reduce habitat carrying capacity (reduce access to food)
 - Focal population suppression

Challenges to National ORV Program

Potential for Rabies Translocation

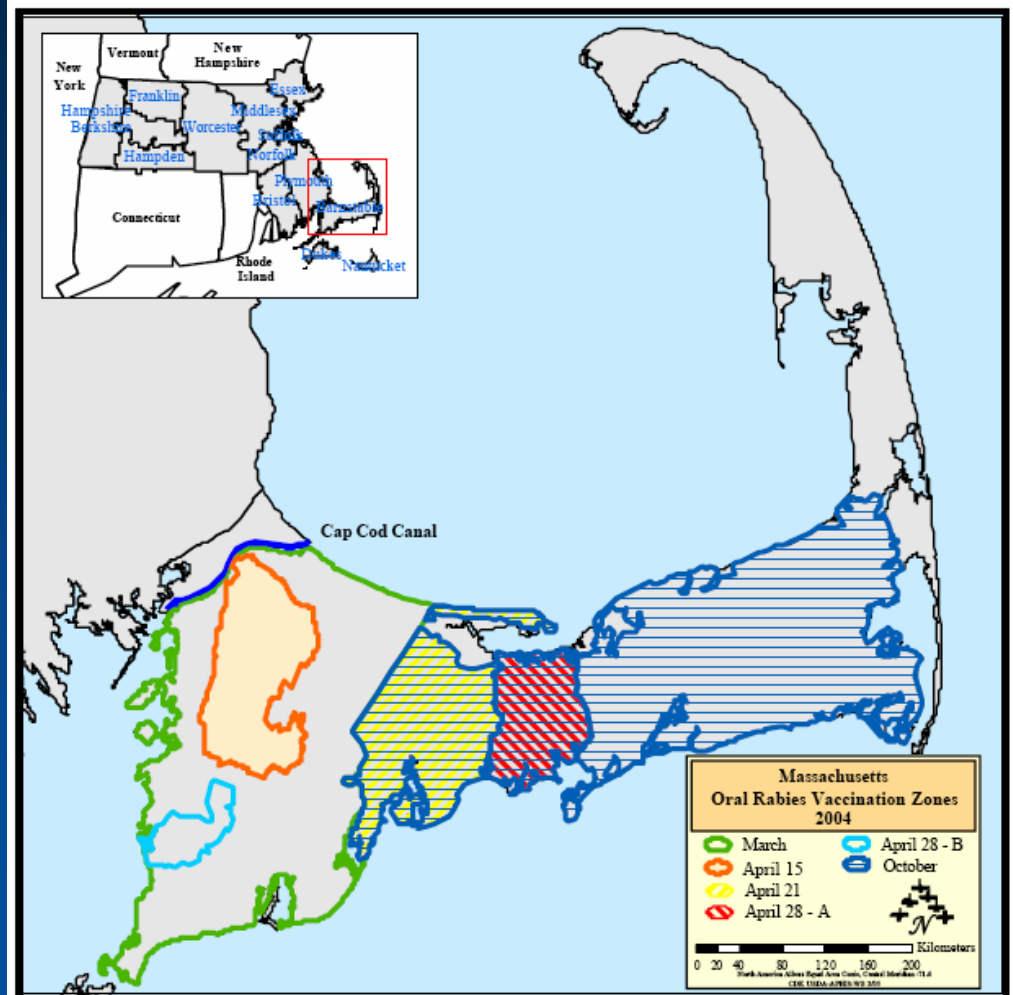
- Education of key groups
 - Translocation of vector species near ORV zones must NOT be allowed
 - Wildlife damage control agents
 - Dog trainers
 - Hunters
 - Trappers
 - Rehabilitators ???
- Remember how rabies moved from FL to WV in 1970's....

ORV on a Local Level, is it Cost Effective?

- What is the cost of dealing with wildlife rabies?
 - Veterinary, medical, legal and insurance costs
 - Direct and indirect
 - Potential savings on any of these costs is viewed as a benefit of ORV
- Methodologies to compute potential net savings and benefit to cost ratios exist

Sterner, et al. Oral Rabies Vaccination: Reducing Economic Uncertainty via Response Surface Analysis. Proceeding of the 10th Wildlife Management Conference. 2003

ORV Success for 10 Years, Cape Cod then...



VETERINARY ASSOCIATES OF CAPE COD



16 Commonwealth Ave. • South Yarmouth, MA 02664 • Phone: 508-394-3566 • Fax: 508-394-7320

SOUTH YARMOUTH—As a man lay in a coma in a New Hampshire hospital with one of the first cases of rabies in New England in years, the Cape Cod's Rabies Task Force yesterday offered half-price (\$10) rabies vaccines at clinics from Plymouth to Provincetown.

"Rabies is fatal," said Dr. Tom Burns, president of the Cape Cod Veterinary Medical Association. "Our role as veterinarians is not just to protect animals, but the public health."

Rabies has been present on Cape Cod since at least 2004.



Results, NC

	# Samples Tested	# Pos Rabies Serology	% Pos
Pre ORV 2001	28	1	4 %
Post ORV 2005	129	9	7%
Post ORV 2006	121	16	13%

Yancey County, 2006



